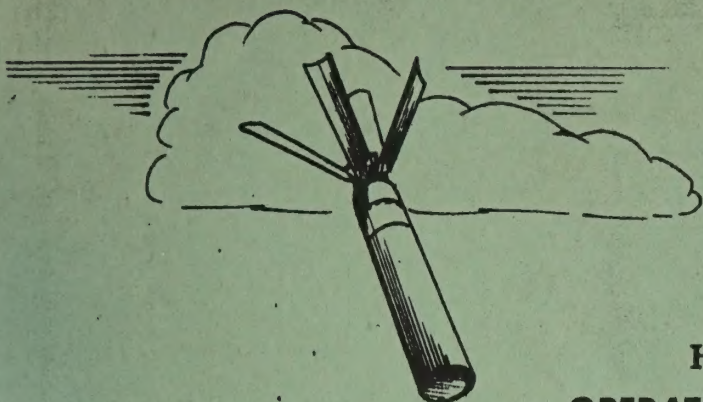
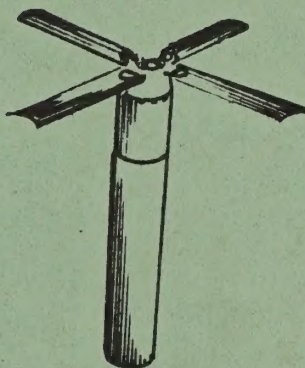




**HANDBOOK
OPERATING INSTRUCTIONS**

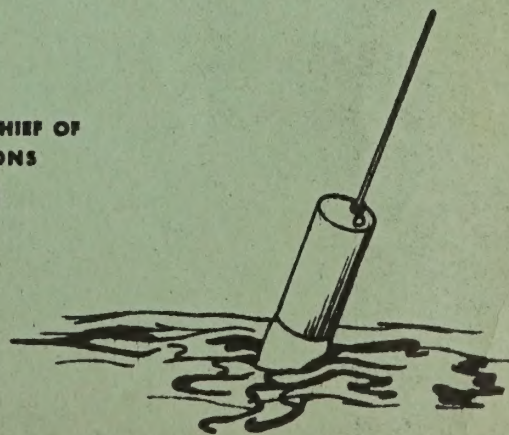
AN/SSQ-23A SONOBUOY



**THIS MANUAL APPLIES TO
SONOBUOY AN/SSQ-23A
AS MANUFACTURED BY SPARTON ELECTRONICS
DIVISION OF SPARTON CORPORATION
MANUFACTURER DESIGNATION 82268**

**PUBLISHED BY DIRECTION OF THE CHIEF OF
THE BUREAU OF NAVAL WEAPONS**

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INTRODUCTION

Sonobuoy AN/SSQ-23A is an expendable item designed to be dropped into the sea from an aircraft. When so placed in the sea it detects underwater sounds and, by means of a self-contained transmitter, transmits sound to the dispensing aircraft or to another suitable radio receiving station.

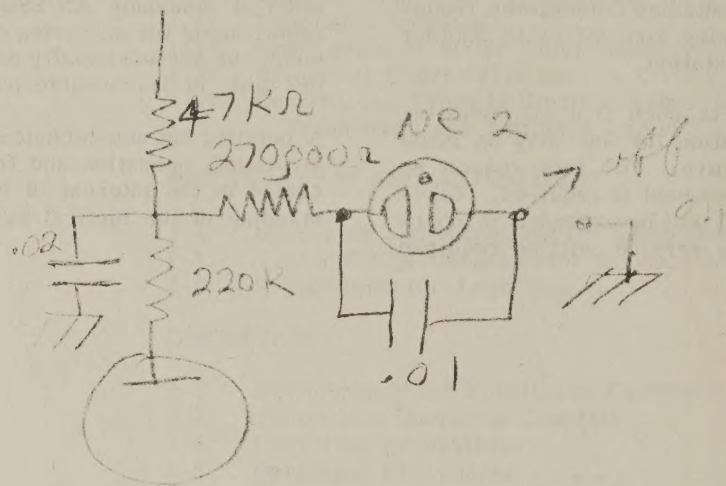
The design of the unit is such that all operating adjustments and preparation for use may be made at the time of manufacture. For this reason no preflight checking or adjustment is required. Likewise, since the equipment will be expended in operation, no maintenance or service will be required

in normal usage.

This handbook describes the installation and operation of Sonobuoy AN/SSQ-23A. Since there is no requirement for servicing or maintaining the equipment, the section usually devoted to maintenance and the table of replaceable parts have been omitted.

A detailed but non-technical description of the construction, operation and theory of operation is included in the interest of furthering a better understanding of the tactical use of the equipment.

tone osc
V4A



SECTION I

GENERAL DESCRIPTION

1-1. PURPOSE OF HANDBOOK

1-2. This handbook describes the installation and operation of Sonobuoy AN/SSQ-23A.

1-3. PURPOSE OF THE EQUIPMENT.

1-4. Sonobuoy AN/SSQ-23A (see figure 1-1) detects underwater sounds and, by means of a self-contained transmitter, transmits sound intelligence by radio to nearby aircraft or other suitable receiving stations.



Figure 1-1. Sonobuoy AN/SSQ-23A, Equipment Supplied

1-5. GENERAL PRINCIPLES OF OPERATION.

1-6. Sonobuoy AN/SSQ-23A is an expendable unit designed to be dropped into the sea from an aircraft. The drop limitations from the aircraft are a speed of 150 knots at a minimum altitude of 150 feet or a speed of 250 knots at a minimum altitude of 500 feet.

1-7. When the sonobuoy has cleared the launching tube, the rotochute (four autorotational blades) opens to stabilize and slow the descent of the sonobuoy to the water (see figure 1-2, detail A). When the sonobuoy strikes the water, the rotochute is jettisoned, and an orange-red dye colors the surrounding water (see figure 1-2, detail B). At the same time, a hydrophone is released (see figure 1-2, detail C) and sea water enters the battery compartment. Sea water activates the batteries and within 90 seconds the sonobuoy is operating.

1-8. Underwater sound waves are detected by the hydrophone, transmitted to the floating assembly (by way of a waterproof cable), amplified and used to frequency-modulate a transmitter. The signal emitted by the transmitter, when demodulated by a suitable receiver, provides a means of identifying and locating the underwater sound sources.

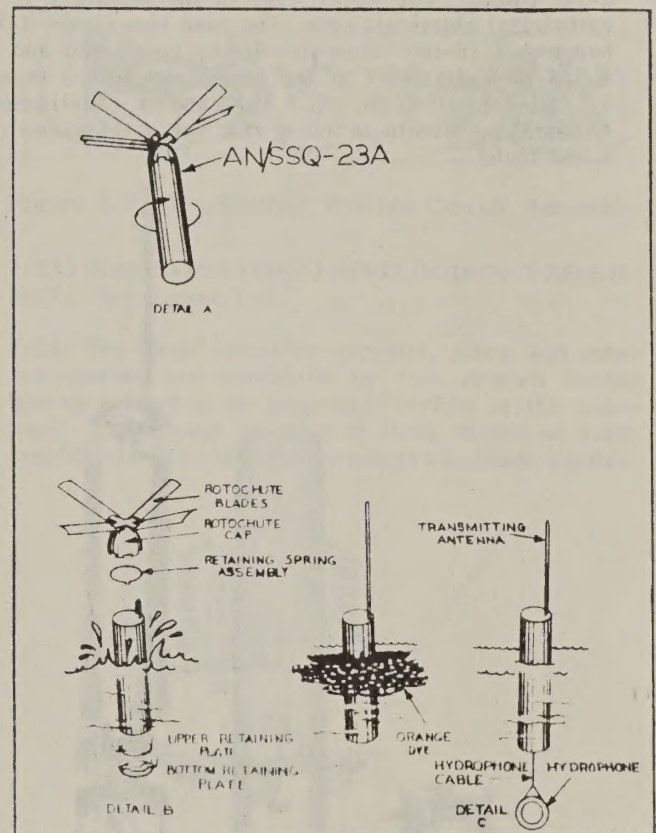


Figure 1-2. Sequence of Operation

1-9. During the daylight hours, close range visual location of the sonobuoy is determined by the orange-red dye marker that colors the surrounding water. At night, close proximity of the sonobuoy is determined by a small incandescent lamp located on the antenna deck.

1-10. Sonobuoy AN/SSQ-23A incorporates an automatic scuttling device consisting of a water-soluble plug located in the outer casing below the waterline. When the plug dissolves, water enters the interior of the watertight compartment causing the sonobuoy to sink. The floating period of the sonobuoy is a function of water temperature, the plug dissolving more rapidly in warmer water. In no case, however, is it less than 1 nor more than 15 hours.

Section 1

Paragraphs 1-11 to 1-19

AN/SSQ-23A

1-11. EQUIPMENT SUPPLIED.

1-12. The equipment supplied is listed in table 1-1 and shown in figure 1-1.

1-13. DESCRIPTION OF MAJOR COMPONENTS.

1-14. GENERAL. Sonobuoy AN/SSQ-23A is a single, compact assembly contained within a cylindrical, aluminum case (see figure 1-3). The major components contained within the case are divided into the antenna and electronics chassis assembly, and the battery and hydrophone assembly. The major components of Sonobuoy AN/SSQ-23A are described in the following paragraphs.

1-15. CASE. The outer case of the sonobuoy is a cylindrical aluminum case. The case (see figure 1-3) has a 4-9/16-inch diameter at the upper end and a 4-7/8-inch diameter at the lower end with a taper 7-1/2 inches from the top. The case is constructed of seamless aluminum tubing that has a thickness of 0.050 inch.

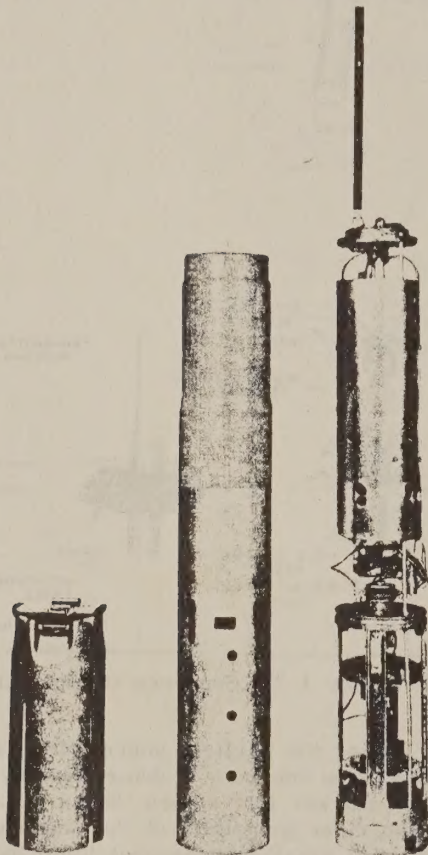


Figure 1-3. Sonobuoy AN/SSQ-23A, Major Components

1-16. SCUTTling PLUG. The scuttling plug is constructed of water-soluble material and is located 8-1/2 inches from the top end of the case. The plug is approximately 3/8 inch in diameter.

1-17. ROTOCHUTE. (See figure 1-4.) The rotochute assembly mounts as a detachable cap over the antenna on the top end of the case of the sonobuoy. The assembly consists of an aluminum alloy trunnion that rotates on a shaft fastened to the cap. Four curved blades hinged to the trunnion open out and rotate when the sonobuoy is launched from the aircraft. The rotation of the rotochute blades acts as a stabilizing force and reduces the rate of descent during free fall. Upon impact with the water the upward thrust of a rod, resting on a bottom retaining plate and extending the full length of the case, releases a retaining ring which secures the rotochute assembly to the sonobuoy housing, allowing the lifting force of air against the blades to jettison the rotochute assembly. When stored before use the curved blades of the rotochute assembly fold over the case of the sonobuoy to form a compact unit. The blades are held against the case with a paper tape marked "REMOVE BEFORE LAUNCHING". The tape must be removed before the sonobuoy is launched from the aircraft.

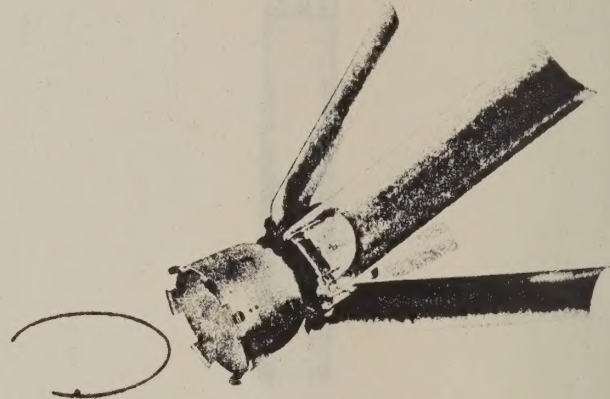


Figure 1-4. Rotochute Assembly

1-18. ANTENNA CHASSIS ASSEMBLY. See figures 1-5, and 1-6.

1-19. TRANSMITTING ANTENNA. The FM transmitting antenna is a quarter-wave, vertical antenna approximately 16-3/4 inches in length. The antenna is constructed of steel tape and is coiled under the cap of the rotochute assembly when the equipment is not in use. The antenna is held in a coiled position by a water-soluble paper band which prevents the antenna from fouling the rotochute. The method of retaining the antenna simplifies the installation of

Table 1-1. Equipment Supplied

Quantity per Equipment	AN Nomenclature		Over-all Dimensions		Weight (lbs)	Numerical Series of Reference Designation
	Name	Type	Length	Dia.		
1	Sonobuoy	AN/SSQ-23A	36"	4-7/8"	18.00	201-599

the detachable rotachute assembly. When the rotachute assembly is jettisoned, water dissolves the paper retaining band, and the antenna springs into a vertical position.



Figure 1-5. Antenna and Electronic Chassis Assembly

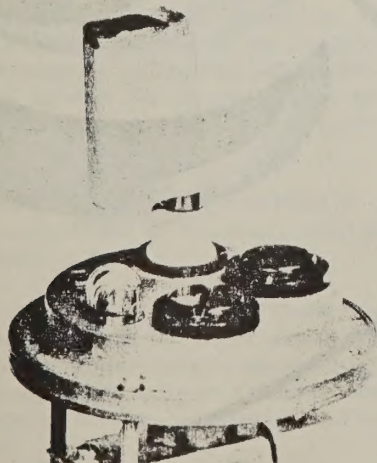


Figure 1-6. Antenna Chassis Assembly

1-20. NIGHT MARKER. The night marker is a single 6-volt incandescent lamp having approximately one candlepower. The lamp is in continuous operation as long as the batteries are active.

1-21. TRANSMITTER PRINTED CIRCUIT ASSEMBLY. See figure 1-7.

1-22. The transmitter circuits, tubes, coils and other components are contained on a printed wiring board mounted in the watertight portion of the sonobuoy. The transmitter consists of an oscillator followed by two frequency doubler stages. The output of the final frequency doubler is applied to the transmitting antenna. The oscillator is frequency modulated by application of the signal from the sonic amplifier.

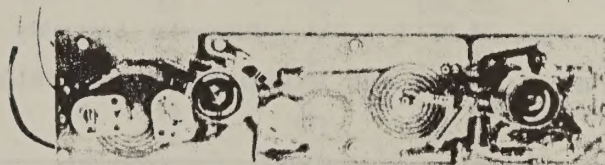


Figure 1-7. Transmitter Printed Circuit Assembly

1-23. SONIC AMPLIFIER PRINTED CIRCUIT ASSEMBLY. See figure 1-8.

1-24. The sonic amplifier circuits, tubes and other components are contained on two printed wiring boards located in the watertight portion of the sonobuoy. The circuit consists of three stages of audio amplification, an AGC circuit and an amplitude limiter.

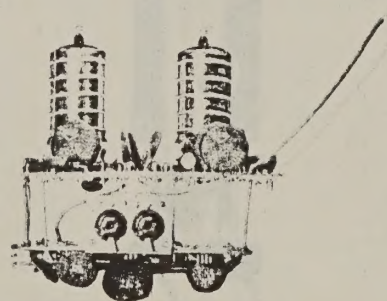


Figure 1-8. Sonic Amplifier Printed Circuit Assembly

1-25. D-C POWER CONVERTER ASSEMBLY. See figure 1-9.

1-26. The high voltage d-c power required by the vacuum tube plate circuits is supplied by a dc - to - dc voltage converter mounted immediately below the electronic assembly within the watertight portion of the sonobuoy. The circuit consists of a pair of switching transistors operating off the 13-volt "A" battery to excite a power transformer. The voltage is stepped up in the power transformer, rectified by diodes, and filtered by an LC filter. Additional filtering in the input lead blocks feedback of switching transients into the supply battery.

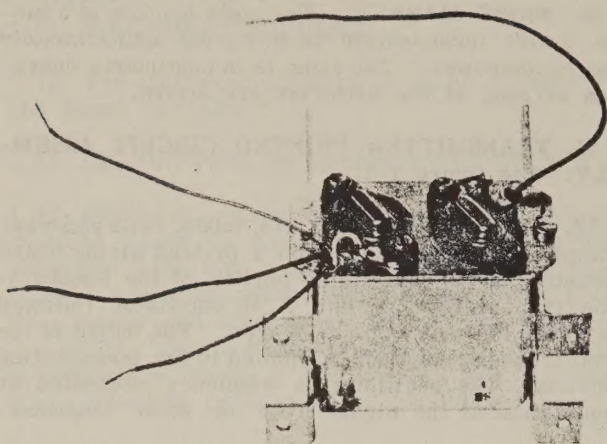


Figure 1-9. D-c Power Converter Assembly

1-27. BATTERY AND HYDROPHONE ASSEMBLY.
See figure 1-10.

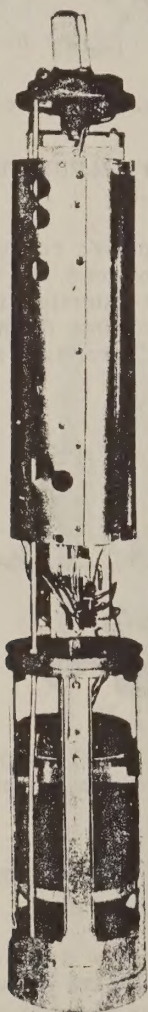


Figure 1-10. Sonobuoy AN/SSQ-23A, With Case
Removed Showing Battery, Hydrophone, and
Dye Assembly

1-28. BATTERY. (See figure 1-11.) A specially
designed, magnesium silver chloride, sea water act-
ivated battery, located in the lower flooded portion,
powers the sonobuoy. The battery is designed to

withstand the effects of prolonged storage in humid
atmosphere without use of sealed enclosures, there-
fore no breakable seals are required. Likewise,
operation at 13 volts reduces internal currents to a
point at which purging is not a design consideration.

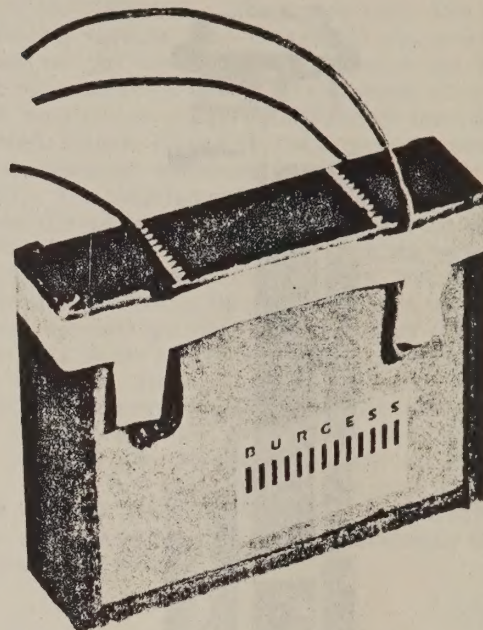


Figure 1-11. Battery Assembly

1-29. HYDROPHONE. (See figure 1-12.) The hydro-
phone is a barium titanate bilaminated cell sealed
in a waterproof case of synthetic rubber. It is
connected to the input of the sonic amplifier by a
60 ft. length of single conductor, shielded, waterproof

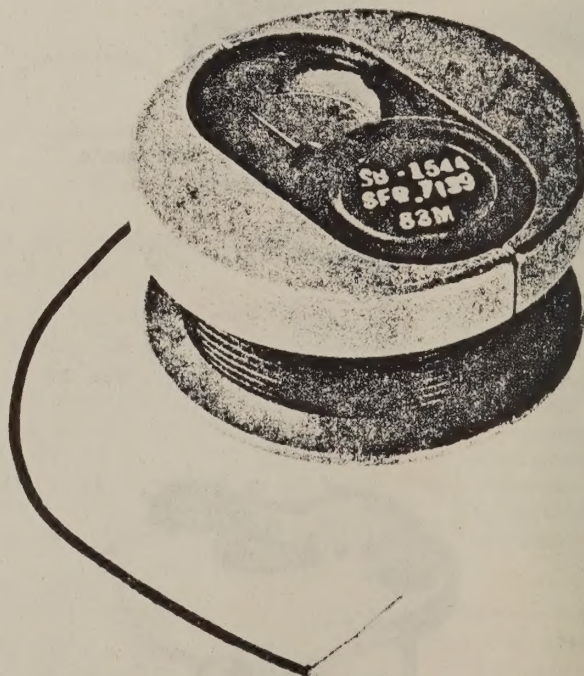


Figure 1-12. Hydrophone Mounted in Cable Reel

coaxial cable. The cable reel is normally stored in the lower compartment with the hydrophone mounted in a cavity on its lower face. When the sonobuoy strikes the water the cable reel is released and drops to a depth determined by the length of the cable. Upon reaching the cable end the two halves of the reel part and fall away releasing the hydrophone. Because of the weight of the reel this action is rapid and reliable. Pressure variations, such as those caused by underwater sounds, cause the hydrophone to generate voltages which are transmitted through the connecting cable to the input of the sonic amplifier.

1-30. DAY MARKER. See figure 1-13.

1-31. The day marker consists of a cake of coal tar dye in glycol binder molded into annular form and mounted in the lower flooded portion of the sonobuoy. When acted upon by sea water the dye is forcibly ejected by chemical action, thus imparting an orange-red color to the water immediately surrounding the sonobuoy. The dye is so proportioned that a slick is formed starting within 60 seconds and continuing for the operating life of the buoy.



Figure 1-13. Day Marker (Dye)

1-32. ELECTRICAL CHARACTERISTICS.

1-33. FREQUENCY RANGE. Sonobuoy AN/SSQ-23A is factory adjusted to one of the assigned carrier-frequency channels within the 162 to 174-mc range. The channel number is stenciled near the center of the case and corresponds to the frequencies shown in table 1-2.

1-34. OPERATING CHARACTERISTICS. The operating characteristics of Sonobuoy AN/SSQ-23A are listed in table 1-3.

1-35. D-C SUPPLY VOLTAGE. Power for the electron tube heaters, for the night marker and for the d-c high voltage converters is supplied by a specially designed magnesium silver chloride battery. The nominal battery voltage supplied is 13 volts tapped at 6.5 volts.

1-36. CURRENT REQUIRED. The normal battery drain is 2.25 amps total for both 6.5-volt sections.

Table 1-2. Transmitter Frequency Channels

Channel Number	Frequency (mc)
1	162.25
2	163.00
3	163.75
4	164.50
5	165.25
6	166.00
7	166.75
8	167.50
9	168.25
10	169.00
11	169.75
12	170.50
13	171.25
14	172.00
15	172.75
16	173.50

1-37. QUANTITY AND TYPES OF ELECTRON TUBES, DIODES, TRANSISTORS, AND INDICATOR LAMPS.

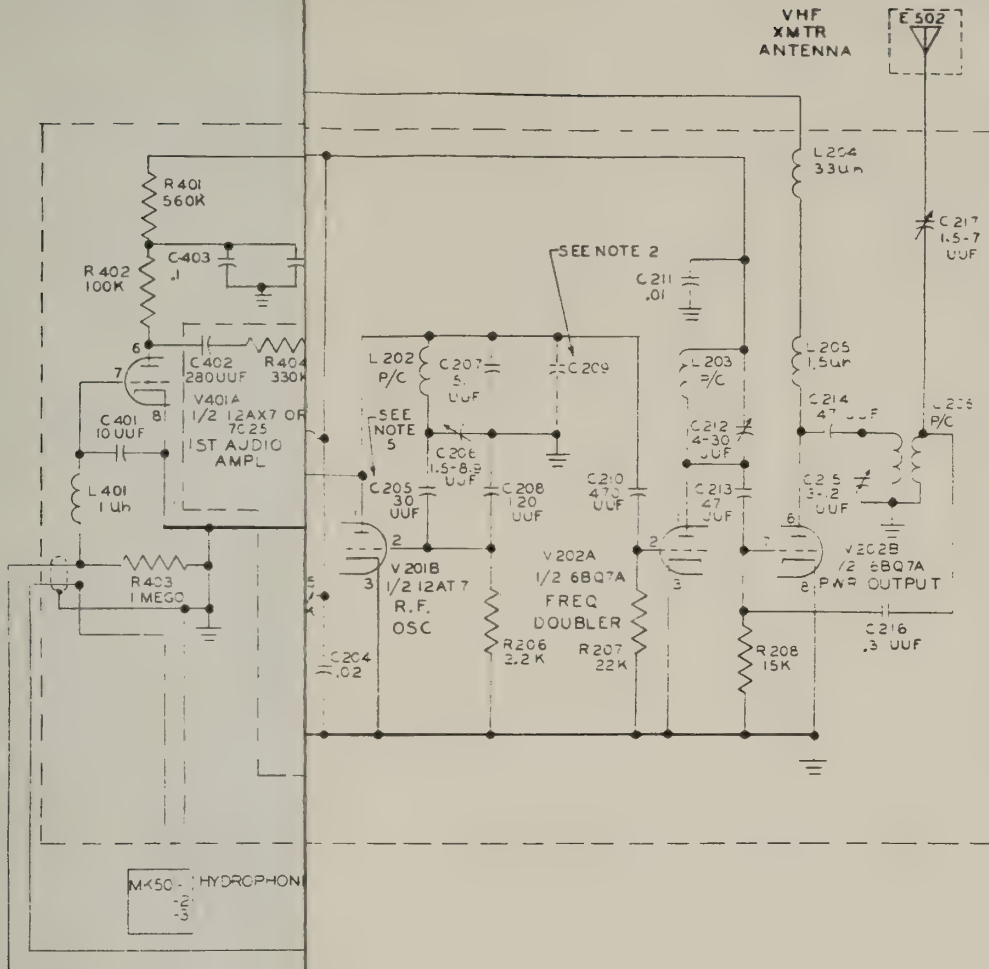
1-38. The quantity and types of electron tubes, transistors, diodes, and indicator lamps are listed in table 1-4.

Table 1-3. Operating Characteristics

Transmitter Power Output	0.25 watt (min).
Transmitter Frequency Stability	Within 100 kc of preset frequency within one minute of activation. Preactivation temperature between -20°C (-4°F) and +35°C (+95°F).
Frequency Modulation Characteristics	
1. Sensitivity	25% Modulation (19 kc deviation) with a 2000 cps signal at a level 3 db above 1 dyne/cm ² applied to hydrophone.
2. Response	Within specified characteristic between 100 and 10,000 cps.
3. Linearity	Essentially linear from 0 to 100% modulation.
4. Distortion	Not in excess of 10% at 100% modulation.
Hydrophone Operation	Hydrophone drops to maximum depth of 60 feet.
Listening Range	Limited by ambient sea noise; under sea state conditions class 1 to 5.
Power Supply, Self-Contained	Sea water activated battery.
Sonobuoy Operating Life	Minimum of one hour in sea water at 0°C (+32°F) to +30°C (+85°F).
Shelf Life	Five years.

Table 1-4. Electron Tubes, Diodes, Transistors, and Indicator Lamps

Tube, Diode, Transistors, and Indicator Lamps							
	1N76A	6BQ7A	12AT7	7025 12AX7	51	Sparton part No. 150567	TOTAL
Sonic Amplifier				2		3	5
Transmitter		1	1				2
Antenna Chassis Assy	1				1		2
Total	1	1	1	2	1	3	9



NOTES:

1. ELECTRICAL VALUES OF COMPONENTS GIVEN IN OHMS MICROFARADS & MICROHENRIES UNLESS OTHERWISE SPECIFIED.
2. CAP C209 MAY BE PRESENT IF REQUIRED FOR TEMPERATURE COMPENSATION. VALUE MAY BE 1,2,3 OR 4 UUF WITH NEGATIVE TEMP COEFF OF 1400.
3. ALL RESISTORS 1/2WATT UNLESS OTHERWISE SPECIFIED.
4. C413 820UUF WILL BE PRESENT WHEN -2 HYDROPHONE, MK-501-2 IS USED, R411 WILL BE 4.3K WHEN -3 HYDROPHONE MK 501-3 IS USED.
5. C205 360UUF WILL BE PRESENT ON CHANNELS 5 THRU 16 C205 360UUF WILL BE PRESENT ON CHANNELS 1 THRU 11
6. JUMPER MUST BE INSERTED BETWEEN PINS 8 & 9 FOR FIELD USE AFTER ELECTRONIC TEST.

Table 1-3. Operating Characteristics

Transmitter Power Output	0.25 watt (min).
Transmitter Frequency Stability	Within 100 kc of preset frequency within one minute of activation. Preactivation temperature between -20°C (-4°F) and +35°C (+95°F).
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Tube, Diode, Transistors, and Indicator Lamps							
	1N76A	6BQ7A	12AT7	7025 12AX7	51	Sparton Part No. 150667	TOTAL
Sonic Amplifier				2		3	5
Transmitter		1	1				2
Antenna Chassis Assy	1				1		2
Total	1	1	1	2	1	3	9

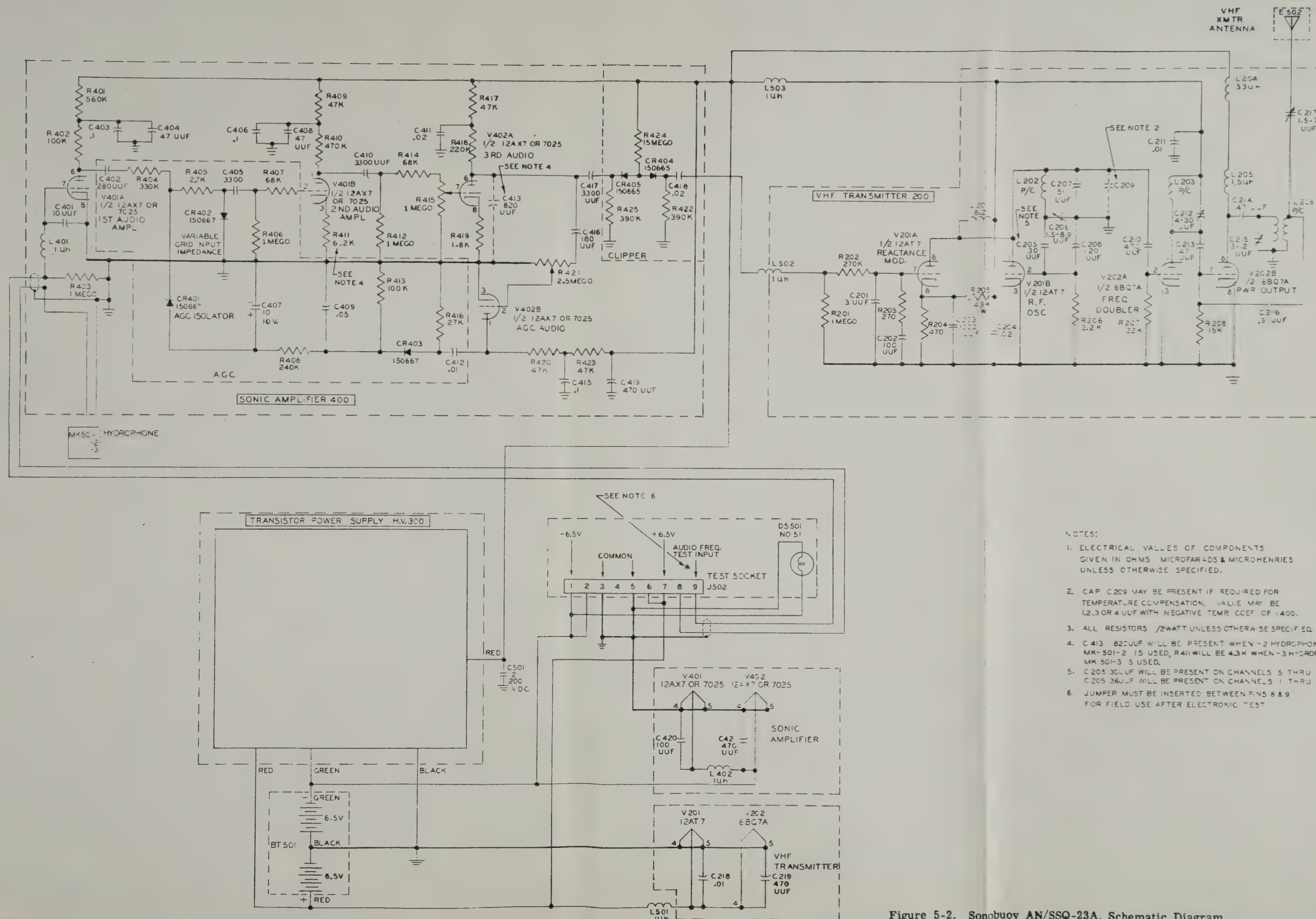


Figure 5-2. Sonobuoy AN/SSQ-23A, Schematic Diagram

SECTION II

INSTALLATION AND ADJUSTMENT

2-1. UNPACKING AND INSPECTING THE EQUIPMENT.

2-2. Each Sonobuoy AN/SSQ-23A is shipped in a separate container per MIL-P-116-Method II, packed four containers to a carton. After removal from the container, the sonobuoy should be visually inspected for evidence of damage, checked with the packing slip and compared with the list of equipment supplied as tabulated in table 1-1 and illustrated in figure 1-1 of this handbook. For visual inspection purposes Sonobuoy AN/SSQ-23A will stand upright on any flat horizontal surface.

2-3. TEST AND ADJUSTMENTS PRIOR TO LAUNCHING.

2-4. All initial adjustments and tests have been performed by the manufacturer. Because of the design features of Sonobuoy AN/SSQ-23A further adjustments are not required prior to launching.

2-5. PREPARATION FOR LAUNCHING.

2-6. Sonobuoy AN/SSQ-23A may be launched by any standard sonobuoy dispenser that is used for Sonobuoy AN/SSQ-2B. The tape marked "REMOVE BEFORE LAUNCHING" must be removed prior to placing the sonobuoy in the sonobuoy dispenser.

SECTION III

OPERATION

3-1. PERFORMANCE AND FUNCTIONS OF EQUIPMENT.

3-2. Sonobuoy AN/SSQ-23A is expendable equipment designed to be dropped into the sea by aircraft moving at a speed of not more than 150 knots at a minimum altitude of 150 feet or at higher speeds up to 250 knots at a minimum altitude of 500 feet. The sonobuoy is equipped with a rotochute to reduce the speed of descent so that the impact with water will not be destructive. Upon impact with the water the rotochute assembly is jettisoned, and the hydrophone is spring ejected. Sea water activates the batteries and within 90 seconds the equipment will operate automatically.

3-3. Underwater sound waves detected by the hydrophone are amplified and used to frequency-modulate the transmitter. When demodulated by a suitable receiver, the transmitted signal provides a means of identifying and locating the underwater sound sources.

3-4. FUNCTION OF OPERATING CONTROLS.

3-5. The operation of Sonobuoy AN/SSQ-23A is fully automatic and operating controls are not provided.

3-6. OPERATING PRECAUTIONS.

3-7. The following operating precautions must be taken prior to the launching of Sonobuoy AN/SSQ-23A:

a. Make certain that paper band marked "REMOVE BEFORE LAUNCHING" has been removed from the rotochute blades.

b. Check to see that release rod fully engages the hole at each end of rotochute assembly retaining ring. If the rod is not fully engaged, the rotochute assembly may be jettisoned before the sonobuoy strikes the water, resulting in loss of equipment.

c. Sonobuoy AN/SSQ-23A may be launched at any altitude greater than 150 feet. The speed of the launching aircraft should not exceed 150 knots at this low altitude. At altitudes greater than 150 feet the airspeed of the launching aircraft may be increased approximately 10 knots for each 35-foot increase in altitude up to a maximum of 250 knots. Sonobuoy AN/SSQ-23A may be launched at greater altitudes but never at speeds in excess of 250 knots. Failure to observe these precautions may result in damage to or loss of the sonobuoy.

3-8. OPERATING PROCEDURES.

3-9. PREFLIGHT CHECKS. Due to the design of Sonobuoy AN/SSQ-23A, preflight operational tests are not required.

3-10. FLIGHT CHECKS. Flight checks of Sonobuoy AN/SSQ-23A are not required. The unit does not operate as an airborne equipment.

3-11. START-STOP PROCEDURE. The operation of Sonobuoy AN/SSQ-23A is automatic. The equipment starts operation after water entry and continues to operate for a minimum of one hour.

3-12. OPERATION. The operation of Sonobuoy AN/SSQ-23A is automatic. For detailed operation refer to paragraph 3-1 of this section.

SECTION IV

THEORY OF OPERATION

4-1. GENERAL.

4-2. Sonobuoy AN/SSQ-23A (see figure 4-1) is a single complete transmitter-receiver designed for use with aircraft to detect underwater sounds. When dropped from an aircraft at heights of 150 feet or greater, the rate of descent is slowed by an auto-rotational mechanism which also establishes the correct aspect for satisfactory water entry. The impact of water entry activates a simple release mechanism which in turn jettisons the descent slowing mechanism, releases the hydrophone and floods the battery

compartment. The primary battery is activated by contact with the sea water, and after a short warmup period the sonobuoy starts to transmit a frequency modulated carrier. For location of the equipment after dropping, the sonobuoy contains a metering type dye marker, that colors the water around it, and an incandescent lamp which aids in locating it at night.

4-3. The principle function of Sonobuoy AN/SSQ-23A is that of picking up underwater sounds and transmitting them to suitably equipped aircraft. This

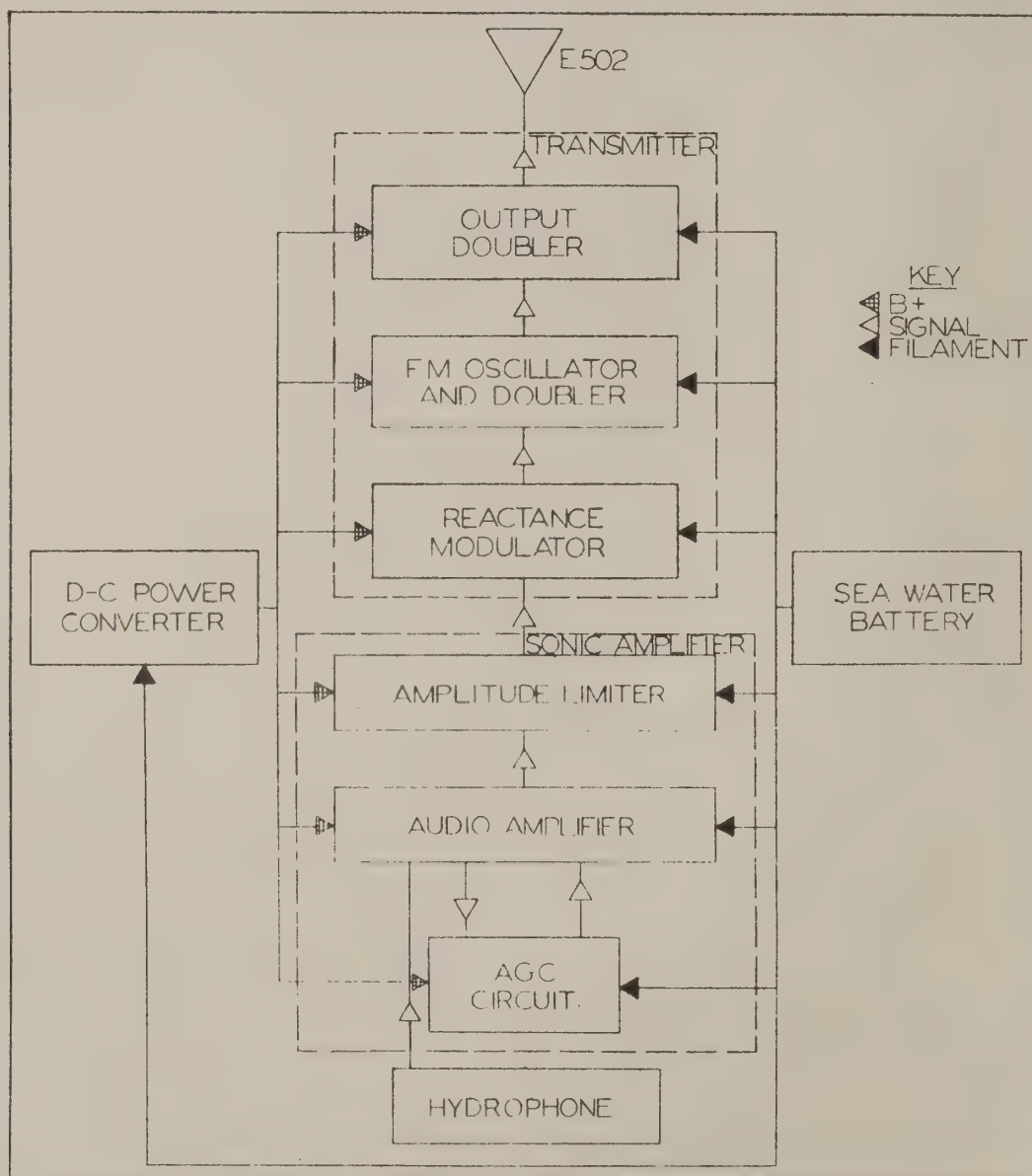


Figure 4-1. Sonobuoy AN/SSQ-23A, Block Diagram

function is performed by a hydrophone, a sonic amplifier, a frequency modulated transmitter and a vertical quarter-wave antenna.

4-4. The block diagram, figure 5-1, illustrates the function of each electron tube, transistor, and diode in Sonobuoy AN/SSQ-23A. It can be seen from the illustration that the sonic amplifier consists of 3 stages of audio amplification and an AGC circuit employing 1 electron tube and 3 diodes. The transmitter consists of a reactance modulator, an oscillator and 2 frequency doublers contained in 2 dual triodes. The block diagrams will be useful in studying the detailed theory of operation given in the paragraphs that follow.

4-5. DETAILED FUNCTIONING OF ELECTRONIC COMPONENTS.

4-6. The following paragraphs describe the detailed functioning of the electronic components of Sonobuoy AN/SSQ-23A. Conventional circuits are described briefly but unusual or special circuits are described in detail.

4-7. **HYDROPHONE.** The hydrophone is of the ceramic type. It consists of a pair of ceramic elements connected in series. Each element is a pre-polarized ceramic disc which has a separate conductive coating on each face. The transducing elements are enclosed in a case molded of synthetic rubber and

sealed to the transmission cable at the point of suspension. The construction of the case is such that when the external faces are subjected to changes in pressure the transducer elements will be flexed or bent. The ceramic material has piezoelectric properties so that flexure caused by impinging sound waves cause voltages to be generated across the output cable terminals. Any sound wave within the frequency range of 100 cps to 3000 cps exerting a pressure of one dyne/cm² will produce a signal approximately 90 db below 1 volt at the cable terminals.

4-8. **SONIC AMPLIFIER.** (See figure 4-2.) The sonic amplifier consists of three stages of audio amplification using one twin triode V401A and V401B (7025/12AX7), and half of a second twin triode V402A (7025/12AX7). The remaining half of twin triode V402B (7025/12AX7) is used as an AGC amplifier. The amplifier circuits are RC coupled in cascade with the series and shunt impedances proportioned to provide the desired overall frequency response.

4-9. The output signal from the hydrophone is applied to the grid (pin No. 7) of V401 through r-f choke L401 which together with capacitor C401 filters rf from the input to V401. The overall gain of the amplifier is nominally 70 db for small input signals. The frequency response of the amplifier is essentially flat between 1000 and 3000 cps with a roll-off of slightly more than 6 db per octave below 1000 cps and above 3000 cps.

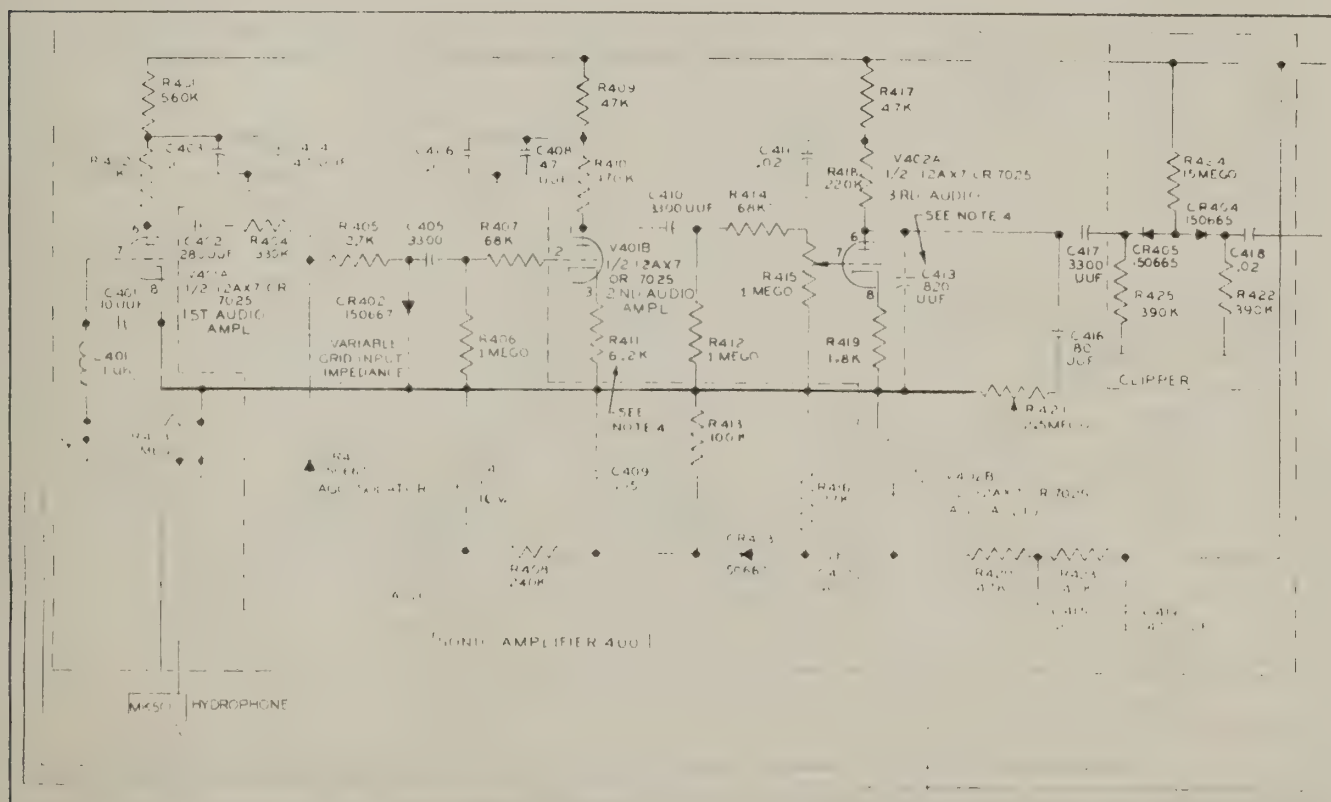


Figure 4-2. Sonic Amplifier Schematic Diagram

4-10. The AGC circuit provides a signal compression ratio of approximately 6:1 to prevent audio overload under high signal input conditions. A portion of the output voltage from amplifier V402A is further amplified in V402B and rectified by crystal diode CR403 (150667). The d-c voltage developed across R413 is applied to crystal diode CR402 (150667) through the resistor R405 and crystal diode CR401 (150667). Application of dc to crystal diode CR402 causes a change in its impedance, making it together with R405 a variable voltage divider. Crystal diode CR401 acts as an AGC isolator effectively blocking the shunting of the a-c signal voltage by C407. A filter network consisting of resistor R408 and capacitor C407 provides a charge time delay of 0.4 seconds and a discharge delay of approximately 2 seconds.

4-11. Variable resistor R415 is used to adjust the gain of the sonic amplifier. Variable resistor R421 is used to set the AGC operating level.

4-12. A symmetrical voltage limiter consisting of two diodes CR404 and CR405 together with resistors R422 and R424 serves to limit the output of the sonic amplifier to a level below the point at which the modulation of the transmitter reaches 150 kc.

4-13. TRANSMITTER. (See figure 4-3.) The transmitter consists of a modified Clapp oscillator V201B

(1/2 12AT7) and two frequency doubler stages V202A (1/2 6BQ7A) and V202B (1/2 6BQ7A).

4-14. The oscillator half of tube V201 is tuned by inductor L202, capacitors C206, C207, C208 and temperature compensating capacitor C209. It is adjusted to the desired frequency with variable air capacitor C206 which is capable of tuning the oscillator to frequencies between 40.5 mc and 43.5 mc. Temperature compensating capacitor C209 connected in parallel with capacitor C207 may or may not be present depending on the characteristics of the individual transmitter. R-f decoupling is provided by inductor L201 and capacitor C210.

4-15. The plate circuit of oscillator V201B is shunted by the plate circuit of the reactance modulator V201A (1/2 12AT7). Ordinarily such a tube acts as a variable resistance. In this case a reactance network consisting of capacitor C202 and resistor R203 is connected in the grid of V201A. Oscillator signal voltage applied across this network in series with the grid-plate capacitance of V201A creates a shift in the phase of V201A plate current, which makes the tube appear as a capacitor across the oscillator inductor L202. When the modulation signal is also applied to the grid of V201A its plate current increases and decreases at the rate of the modulating frequency. This increase and decrease results in an

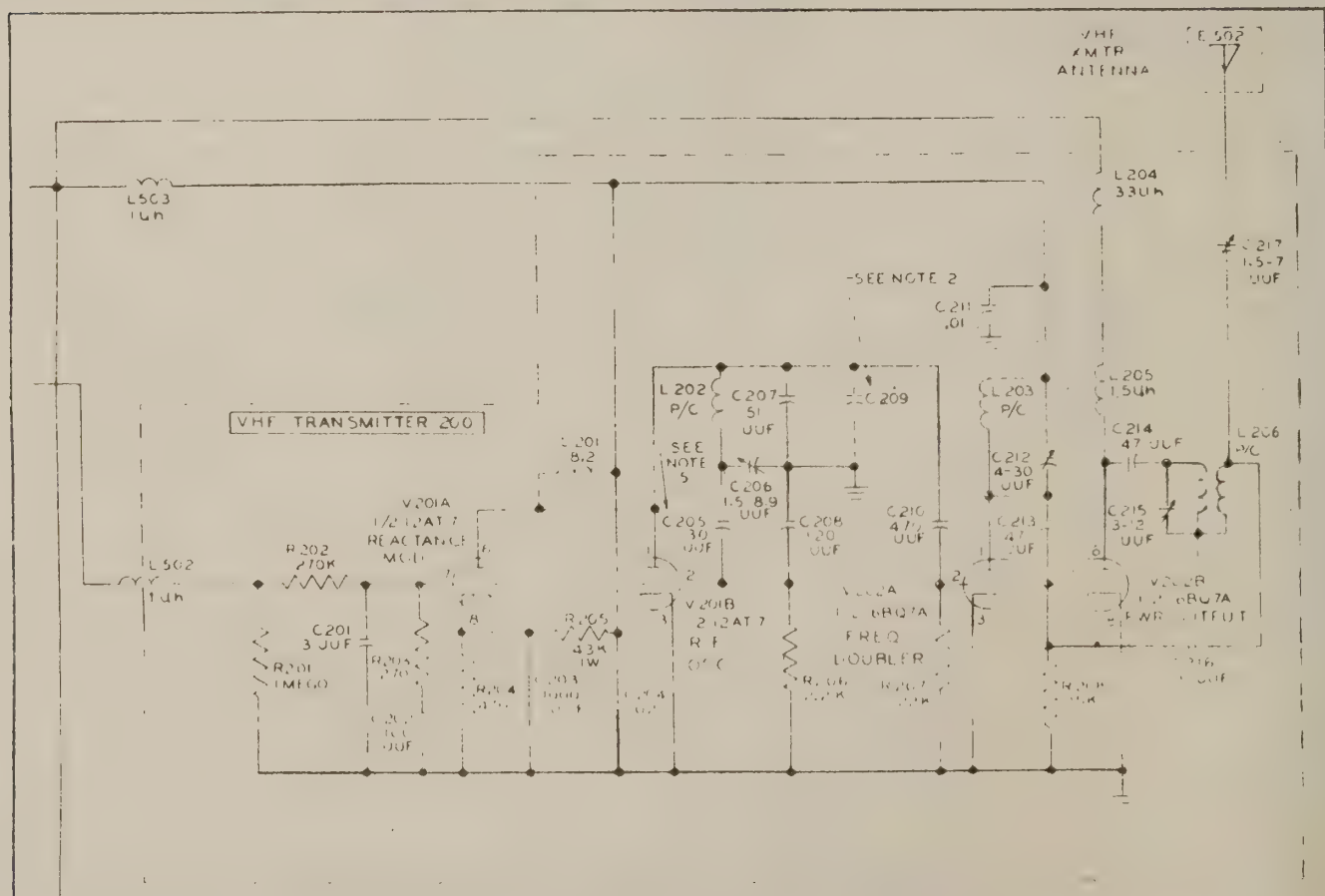


Figure 4-3. Transmitter Schematic Diagram

increase and decrease in the apparent capacitance across the oscillator coil, thus producing frequency modulation of the oscillator stage.

4-16. Two doubler stages follow the oscillator. The output signal of V201B is applied to the grid (pin No. 2) of the first doubler stage. The output tank L203, C212 of V202A (1/2 6BQ7A) is tuned to exactly twice the resting frequency of the oscillator tank. The signal is then coupled to the input of the second doubler through capacitor C213. The output tank L206, C215 of V202B (1/2 6BQ7A) is tuned to twice the frequency of the preceding stage, that is, four times the oscillator frequency. Thus the resting frequency of the output tank circuit is tunable between 162 mc and 174 mc.

4-17. Capacitor C206 is a variable air trimmer and C212, C215 and C217 are variable ceramic capacitors. L202, L203, and L206 are printed circuit coils. L206 is an impedance matching transformer serving

also as the tank circuit inductance for the output doubler stage. C217 is part of the impedance matching between the output stage and the transmitting antenna. All variable capacitors are factory adjusted for optimum transmitter performance.

4-18. SUMMARY. Through operation of the circuits of Sonobuoy AN/SSQ-23A described thus far, the underwater sounds detected by the hydrophone are amplified and produce frequency-modulated signals that are radiated from the antenna at carrier frequencies between 162 mc and 174 mc.

4-19. POWER SUPPLY (See figure 4-4.) Power for operating Sonobuoy AN/SSQ-23A is obtained from a sea water-activated battery. The battery is a specially designed assembly of magnesium silver chloride cells furnishing 13 volts at 2.25 amperes with a center tap at 6.5 volts. A d-c voltage converter, which transforms the 13 volts to 160 volts, is connected across the entire battery. The center tap is grounded.

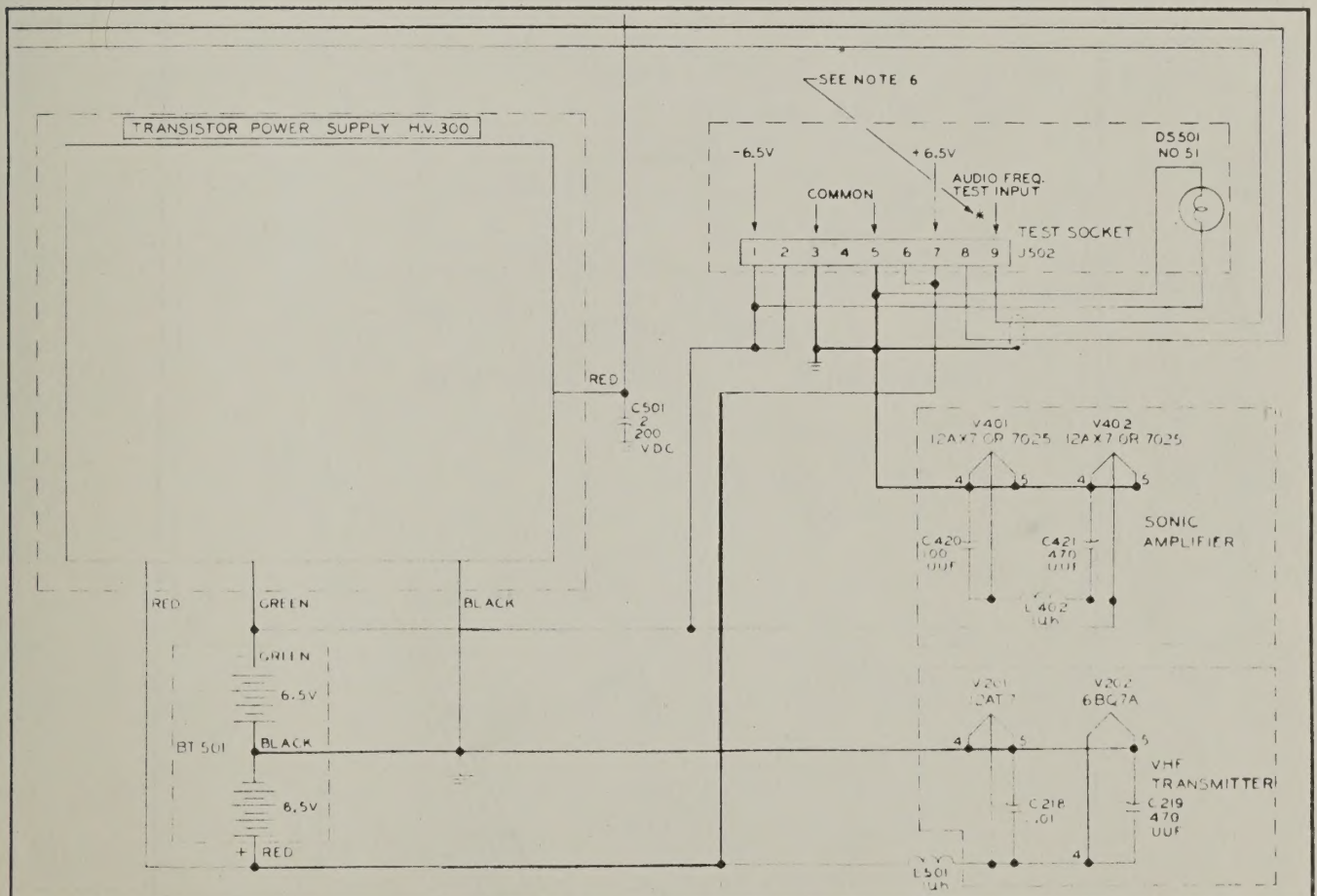


Figure 4-4. D-c Converter Schematic Diagram

SECTION V DRAWINGS

5-1. GENERAL. This section contains two diagrams for Sonobuoy AN/SSQ-23A. Figure 5-1 is an electron tube block diagram useful in understanding the operation of Sonobuoy AN/SSQ-23A. Figure 5-2 is the schematic diagram for Sonobuoy AN/SSQ-23A. Be-

cause Sonobuoy AN/SSQ-23A is an expendable equipment and does not require extensive maintenance, practical wiring diagrams, external wiring diagrams, cable assembly drawings and test data are not required.

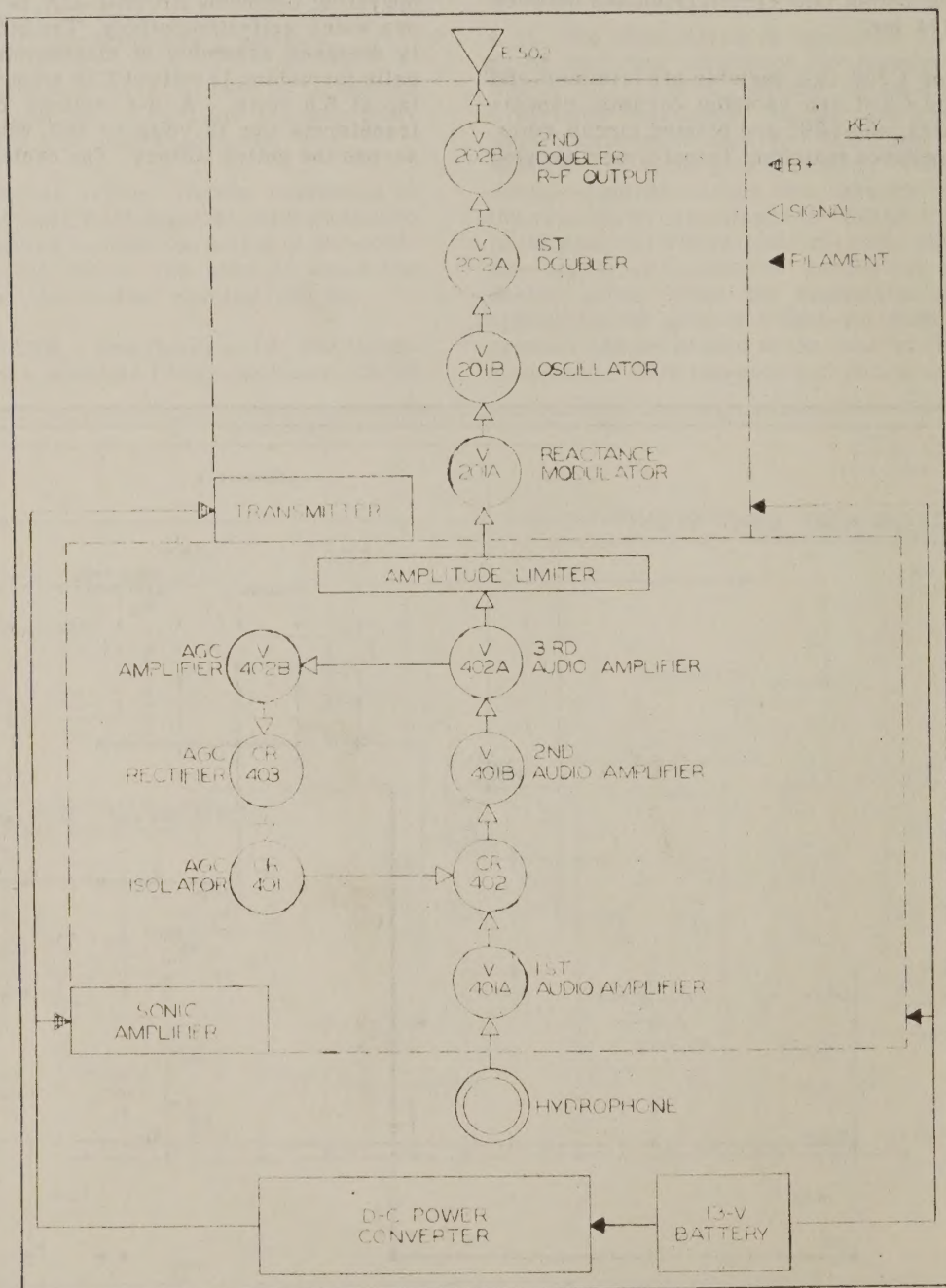


Figure 5-1. Sonobuoy AN/SSQ-23A, Tube Block Diagram

